15 April 1963

MEMORANDUM FOR: Assistant for Plans and Development

THROUGH : Executive Secretary, TDC

SUBJECT : Staff Study - Step and Repeat Printer

1. PROBLEM:

In order to provide the Production Services Division with a high resolution, selective printing capability of duplicate materials both positive and negative, with a choice of one each or multiple copies from the original.

2. FACTS:

To transfer continuous tone imagery from an original negative which inherently contains information resolved in the order of 200 lines per mm or more precludes the possibility of using conventional continuous roll printing techniques, especially if the printing is to be done on a selective, rather than a continuous basis. If we consider the mathematics involved in the usual continuous printing mode which passes the two films around a portion of a drum at speeds up to 60 f/m, we find that even if the drum has a diameter of 24 inches, at least one-third of the original resolution of 200 l/mm would be lost in the transfer simply as a function of the difference in diameter caused by the physical thickness of the reproduction material translated into the resultant difference in speed of travel around the drum and the arc of intercept or printing aperature.

Some other fairly obvious factors compound the difficulty:

a. The random grain pattern in the original negative.
b. The random grain pattern in the reproduction material.
c. The processed emulsion is a three dimentional surface making absolute contact between the two emulsions difficult, if not impossible.
d. The two film materials are not perfectly straight and precisely the same widths and will wander in a lateral direction during transport.
e. The negative emulsion is a turbid medium and so will cause the light to scatter even though it entered as parallel.
f. Difficulty of selecting individual frames or groups of frames for reproduction and subsequent roll processing.

The solution to many, if not all of the above problems appear to dictate that the reproduction of high resolution materials be accomplished by the so called "step and repeat" method of printing. The specific design objectives

were discussed with the Chief, Production Services Division. Some of the objectives are described as necessary while others are termed desirable:

Necessary:

a. Resolution capability of 300 lines per millimeter.
b. Film widths from 70 mm to 9½" continuously.
c. Format lengths up to 50"
d. Equivalent printing speed of 25 f/m at negative density of 2.0.
e. Interchangeable light sources for color and black and white.
f. Selective printing.
g. Multiple copies from one each to ten each.
h. Exposure control manually selected.
i. Programmed film metering of reproduction materials.
j. Film spools up to 1000 foot capacity.
k. Standard or thin base materials.
l. Film transport must be motorized and must not damage either material.
m. Clean room operation.

Desirable:

a. Automatic exposure control.
b. Automatic dodging.
c. Automatic metering and selection.
d. Self-contained positive air pressure.
e. Automatic film exposure counters.

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3. CONCLUSIONS:

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Proposals based on the above design objectives were solicited from [redacted] Response to this invitation to bid is as follows:

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a. [redacted]
b.
c.
d.

If we conclude that step and repeat printing is the proper solution to the problem as stated and discussed, we can proceed to the selection of the best proposal.

4. RECOMMENDATION:

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All of the proposals met all of those design objectives listed as "Necessary." All proposals but one responded on a CPFF basis. [redacted] submitted not only the only fixed price proposal, but the lowest dollar figure. It is therefore recommended that the contract be awarded to [redacted]

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NOTE: Some interest in this same item has been expressed by [redacted] Navy PIC [redacted] It is entirely possible that other members of the community will have similar requirements and therefore possible interest.

[redacted]

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Development Branch, P&DS

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